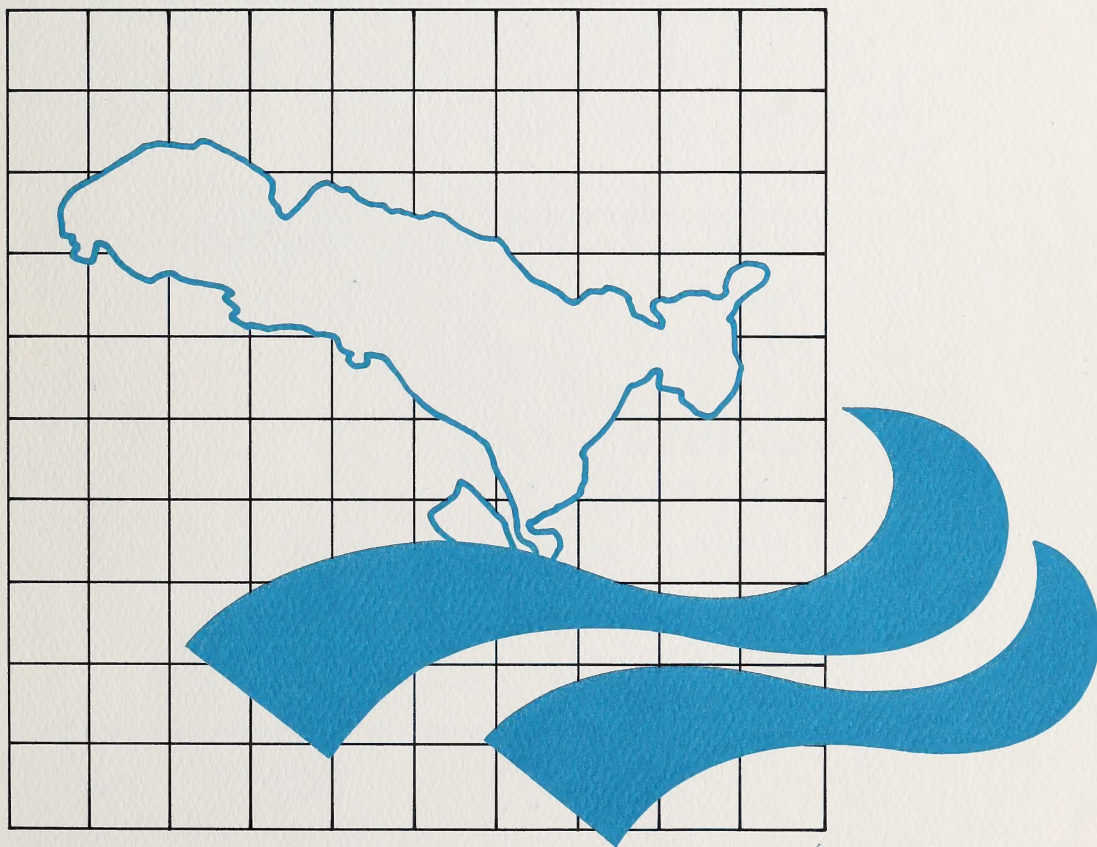


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Wabamun Lake Information Report



Alberta
ENVIRONMENT

DDN
096359

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Objectives

The fluctuation of lake level in Wabamun Lake has been a concern to the lake users. The users have also been confused by the fact that historical lake level records and other surveys conducted in the area were measured relative to two different datums. (A datum is any level surface to which elevations are referred e.g. mean sea level.) In order to clarify the lake level measurements, Alberta Environment hired Usher Canada Ltd. to conduct a topographic survey of Wabamun Lake in the vicinity of the two outlets and Wabamun Creek through the Wabamun Indian Reserve (Paul Indian Band). The survey relates the elevation of the remaining control structure to Wabamun Lake levels, confirms the elevation of benchmarks from which the lake levels are referenced and provides information on the outlet channel.

This report has been prepared, using the results of the survey by Usher Canada Ltd., to provide information on the characteristics of Wabamun Lake, its historical lake level measurements, the outlet control structure and Wabamun Creek.



Location

Wabamun Lake is located approximately 64 kilometres west of Edmonton in the County of Parkland (**Figure 1**). The lake is a popular recreation area and is surrounded by the lakeside Villages of Wabamun, Point Alison, Lakeview and Kapasiwin in the northeast, Seba Beach in the west, and Betula Beach in the southwest. The east shore is the Wabamun Indian Reserve No. 133A. TransAlta Utilities Corporation has built two power plants on the lake: the Wabamun Power Plant on the north shore and the Sundance Power Plant on the south shore. In addition to recreation and power generation use, the lake is also used for commercial fishing. Surrounding lands are mostly used for agriculture and coal mining.

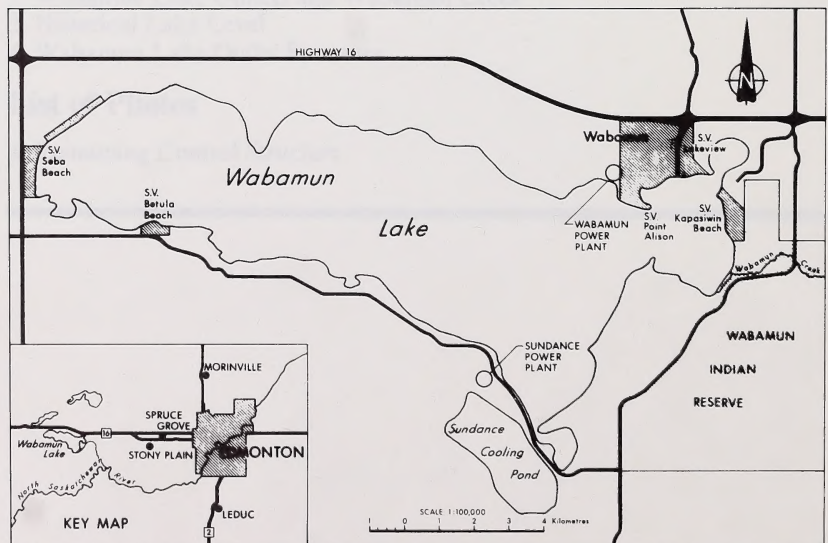


FIGURE 1. LOCATION MAP



Lake Characteristics

Wabamun Lake is part of the North Saskatchewan River System. It collects water from a 270 square kilometre watershed and discharges via Wabamun Creek into the North Saskatchewan River. Wabamun Lake has an average surface lake area of 85 square kilometres. It is about 16 kilometres long and 5 kilometres wide. The average depth of the lake is 5.4 metres with a maximum depth of 11.6 metres. The west end of the lake is generally deeper than the east end. The natural outlet is located at the southeast corner of the lake. In 1912, a new outlet was constructed north of the natural outlet. This man-made outlet shortens the creek course by about 1.6 kilometres (**Figure 2**).

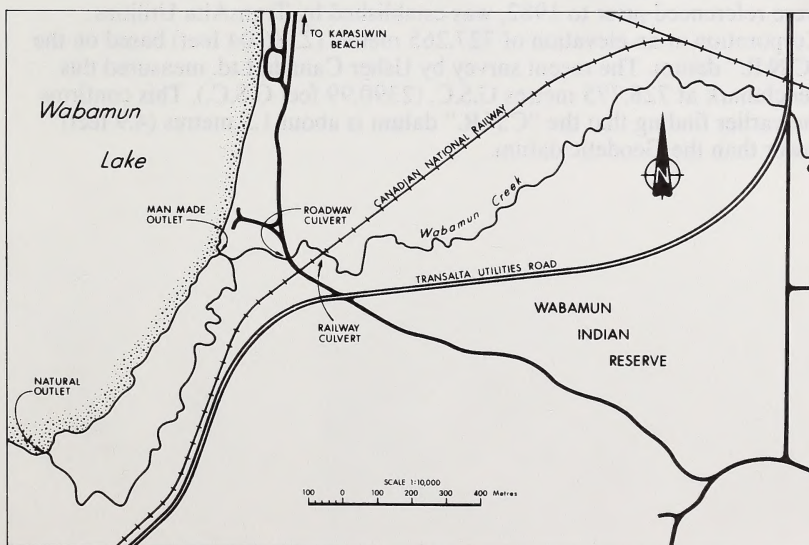


FIGURE 2. WABAMUN LAKE OUTLETS AND WABAMUN CREEK

Lake Level Measurement

The water levels for Wabamun Lake have been published by Water Survey of Canada since 1915. The lake level is currently read approximately three times a week by a TransAlta Utilities Corporation observer. The readings are taken from a staff gauge attached to steel pilings south of the railway bridge, which crosses the cooling water intake canal at the Wabamun Power Plant. The readings from the staff gauge are referenced to the Geodetic Survey of Canada (G.S.C.) datum, which gives the elevations above mean sea level. Elevation checks are carried out twice a year by Water Survey of Canada staff to ensure that the elevation of the staff gauge relative to the Geodetic Survey of Canada datum is accurate. This elevation difference, referred to as the staff gauge datum, is added to the gauge reading to obtain the water level elevation above mean sea level (Geodetic Lake Level).

The present Geodetic Survey of Canada reference benchmark was established in 1982 and lake levels recorded since 1982 are referenced to this benchmark. Prior to 1982, the lake levels were measured from various water level gauges in the vicinity of the present measuring station. (Between 1955 and 1959, the lake levels were recorded from another measuring station at Seba Beach.) These measuring gauges were related to the Canadian National Railways "C.N.R." datum, which was used extensively in the vicinity of Wabamun Lake. This "C.N.R." datum, however, was found to be 1.506 metres (4.94 feet) lower than the Geodetic Survey of Canada datum.

One of the benchmarks (CNR BM#2) from which lake level measurements were referenced prior to 1982, was established by TransAlta Utilities Corporation at an elevation of 727.265 metres (2386.04 feet) based on the "C.N.R." datum. The recent survey by Usher Canada Ltd. measured this benchmark at 728.775 metres G.S.C. (2390.99 feet G.S.C.). This confirms the earlier finding that the "C.N.R." datum is about 1.5 metres (4.9 feet) lower than the Geodetic datum.



Historical Lake Level

The historical lake levels referenced to Geodetic Survey of Canada datum are shown in Figure 3. The graph displays the monthly mean water level of Wabamun Lake from 1915 to 1987. There are some gaps in the record, especially in the earlier years.

The highest monthly mean lake level was recorded in May, 1927 at 725.13 metres G.S.C. (2379.04 feet G.S.C.) and the lowest monthly mean level was recorded in November, 1961 at 723.81 metres G.S.C. (2374.70 feet G.S.C.). The lake has fluctuated between these two extreme levels for the past 72 years. For most of the time, the lake level generally fluctuates within only 1 metre (3.28 feet) between 724.0 metres G.S.C. (2375.33 feet G.S.C.) and 725.0 metres G.S.C. (2378.61 feet G.S.C.).

Control Structure

Several control structures have been constructed by various government agencies, at both the natural and man-made outlets. Most of these structures have deteriorated or have been destroyed. At present, there is no structure at the natural outlet.

A man-made outlet channel was first constructed by local landowners in 1912. It was later blocked and breached repeatedly. In 1927, the Federal Department of the Interior authorized, under the provisions of the Irrigation Act, the Village of Wabamun to construct, operate and maintain a timber sheet pile weir at the man-made outlet. In 1930, the Village of Wabamun refused to assume responsibility for the weir structure. The structure was destroyed in 1944. The federal and provincial governments later entered into an agreement to erect another structure near the location where the original authorized structure was placed. The agreement was between the Federal Department of Mines and Resources and the Provincial Department of Agriculture. Construction was provided by the Federal Department of Public Works and the Provincial Department of Agriculture was responsible for operation and maintenance. A timber sheet pile weir was completed in 1948. A pipe and gate were incorporated in the structure to release water downstream.

The design of the timber sheet pile structure constructed in 1948 is shown in an engineering drawing dated August, 1945. The drawing shows the lake level on April 19, 1945 to be 722.9 metres (2371.8 feet). Water Survey of Canada reports the lake level, based on the "C.N.R." datum, on May 7, 1945 as 722.937 metres (2371.84 feet). The closeness of the two measurements confirms that the elevations given in the 1945 engineering drawing for the timber sheet pile structure were based on the "C.N.R." datum. This timber sheet pile weir was later destroyed by fire in 1964 and was replaced by a steel sheet pile structure in 1965. Today, remnants of the steel sheet pile control structure can still be seen at the man-made outlet (**Photo 1**).

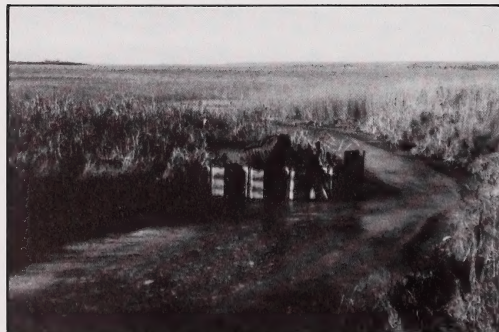


Photo 1. Remaining Control Structure at the man-made outlet. Looking west towards Wabamun Lake (Photo taken November 15, 1987).



The elevations for a number of locations on the remnants of the outlet structure (**Figure 4**) were measured by Usher Canada Ltd. The average elevation measured along the top of the steel sheet piles was 724.96 metres G.S.C. (2378.48 feet G.S.C.). The elevation of the timber sheet pile weir, as shown on the 1945 engineering drawing was 723.0 metres (2372.1 feet) referenced to the "C.N.R." datum. When referenced to the G.S.C. datum, this becomes 724.5 metres G.S.C. (2377.0 feet G.S.C.). The difference between the elevations at the top of the steel sheet piles and the design elevation of the top of timber piles is about 0.5 metres (1.5 feet). It is important to note that these are two entirely different structures which were placed at different times and at two different elevations.

The top of the earth fill crib on the south end of the weir, as shown on the 1945 engineering drawing was 723.78 metres (2374.6 feet) referenced to the "C.N.R." datum. The recent survey by Usher Canada Ltd. measured the elevation of the crib at 725.33 metres G.S.C. (2379.69 feet G.S.C.), about 1.55 metres (5.09 feet) above the design elevation shown on the 1945 drawing. This elevation difference is consistent with the conversion factor of 1.506 metres (4.94 feet) reported by Water Survey of Canada to adjust the "C.N.R." datum to G.S.C. datum.

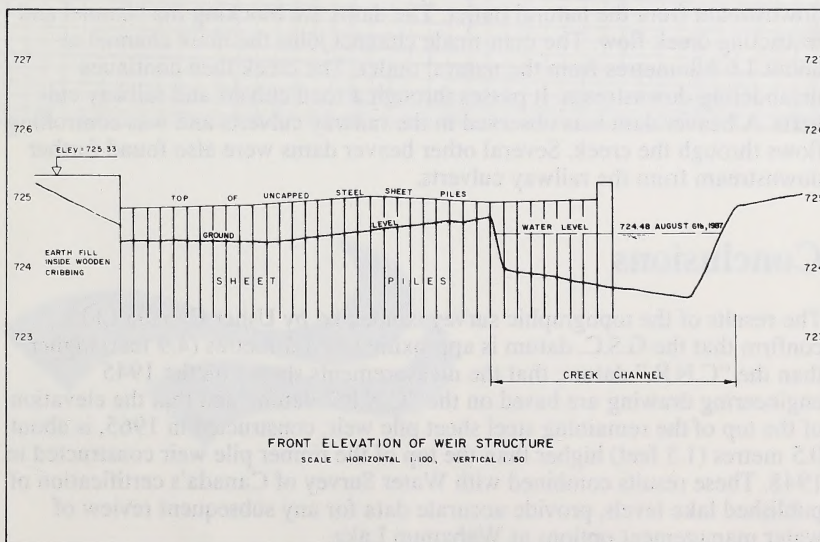


FIGURE 4 WABAMUN LAKE OUTLET STRUCTURE
(AS SURVEYED BY USHER CANADA LIMITED - AUGUST, 1987)

Status of Control Structure under the Water Resources Act

The original control structure was built pursuant to an authorization issued under The Irrigation Act (Canada) in 1927. Provisions of The Water Resources Act of Alberta provide for authorizations granted prior to April 1, 1931, under the Irrigation Act, to remain in force, subject to the conditions of the Water Resources Act and Regulations.

There were a number of parties, who through their previous involvement with the structure hold an interest in the weir. These parties include the Village of Wabamun, the Federal Department of Indian Affairs, the Federal Department of Public Works and Alberta Environment (previously part of the Department of Agriculture). An agreement by the parties or possibly a court decision may be required to state who the present owner should be. It would appear, however, that Alberta Environment can operate and maintain the structure as evidenced by the bilateral agreement with the Federal Government.

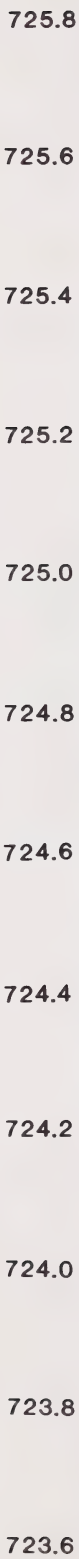
Wabamun Creek

Presently, Wabamun Lake drains into Wabamun Creek at its natural outlet as well as at its man-made outlet (**Figure 2**). There are beaver dams directly downstream from the natural outlet. The dams are blocking the channel and restricting creek flow. The man-made channel joins the main channel at about 1.6 kilometres from the natural outlet. The creek then continues meandering downstream. It passes through a road culvert and railway culverts. A beaver dam was observed in the railway culverts and was controlling flows through the creek. Several other beaver dams were also found further downstream from the railway culverts.

Conclusions

The results of the topographic survey conducted by Usher Canada Ltd. confirm that the G.S.C. datum is approximately 1.5 metres (4.9 feet) higher than the "C.N.R." datum; that the measurements shown on the 1945 engineering drawing are based on the "C.N.R." datum; and that the elevation of the top of the remaining steel sheet pile weir, constructed in 1965, is about 0.5 metres (1.5 feet) higher than the top of the timber pile weir constructed in 1948. These results combined with Water Survey of Canada's certification of published lake levels, provide accurate data for any subsequent review of water management options at Wabamun Lake.

FIGURE 3 - (1)



(1910 - 1919)

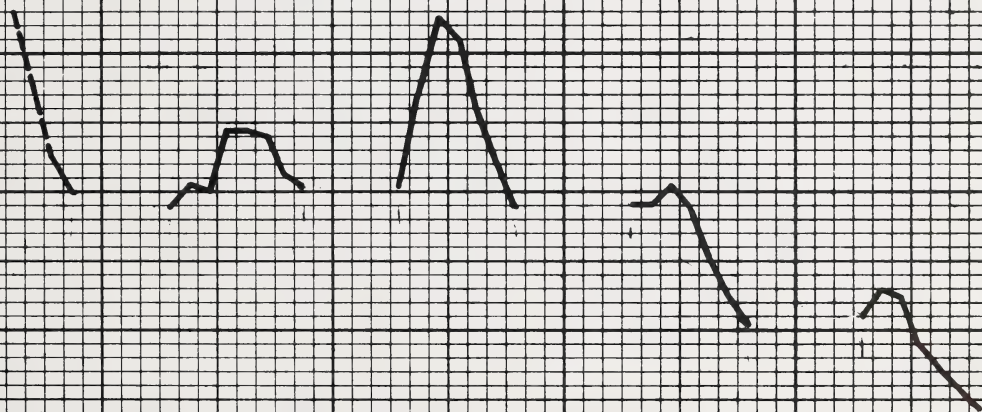
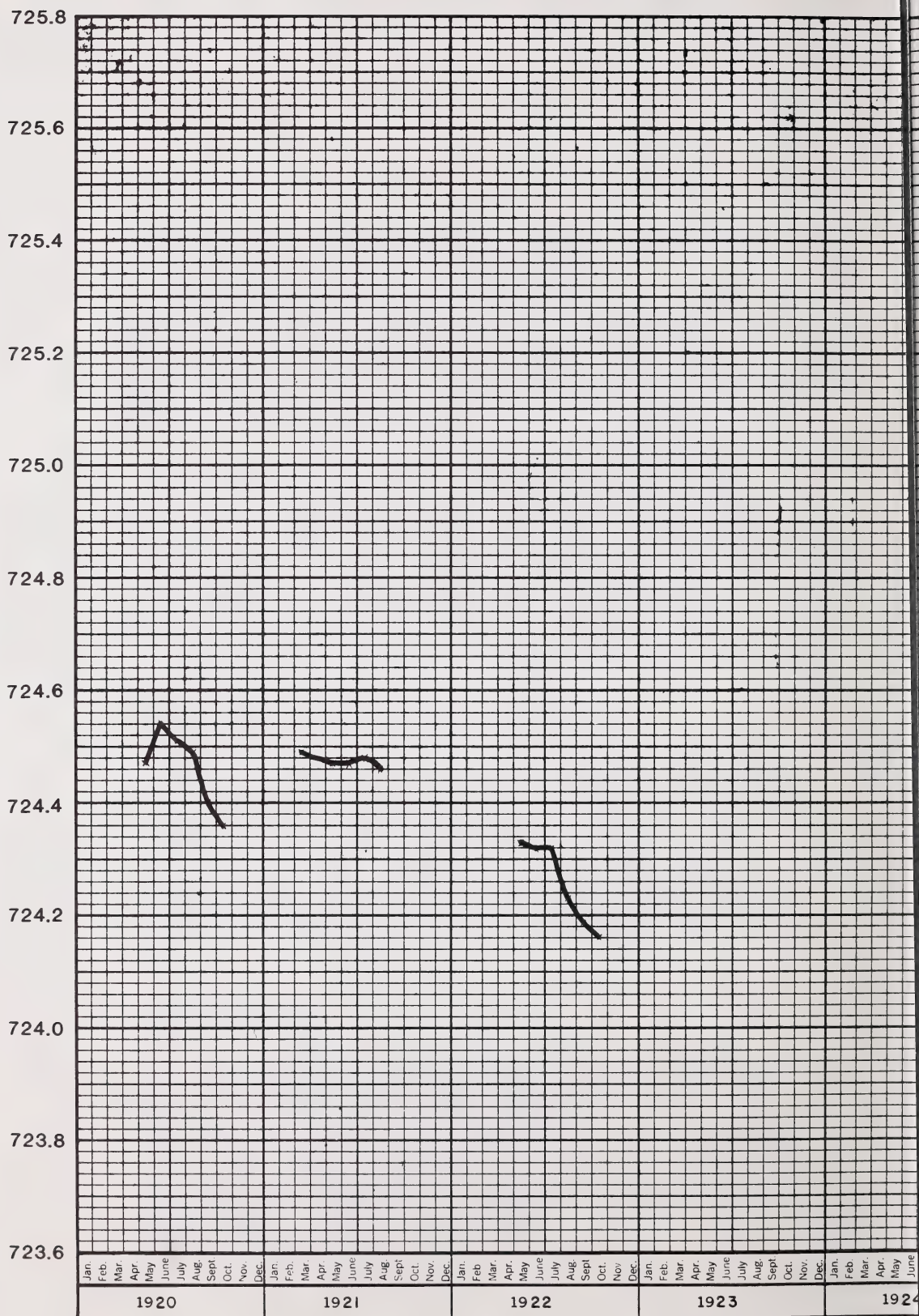
[illegible]

FIGURE 3



FIGURE 3 - (2)
LAKE LEVEL IN METRES (G.S.C. DATUM)



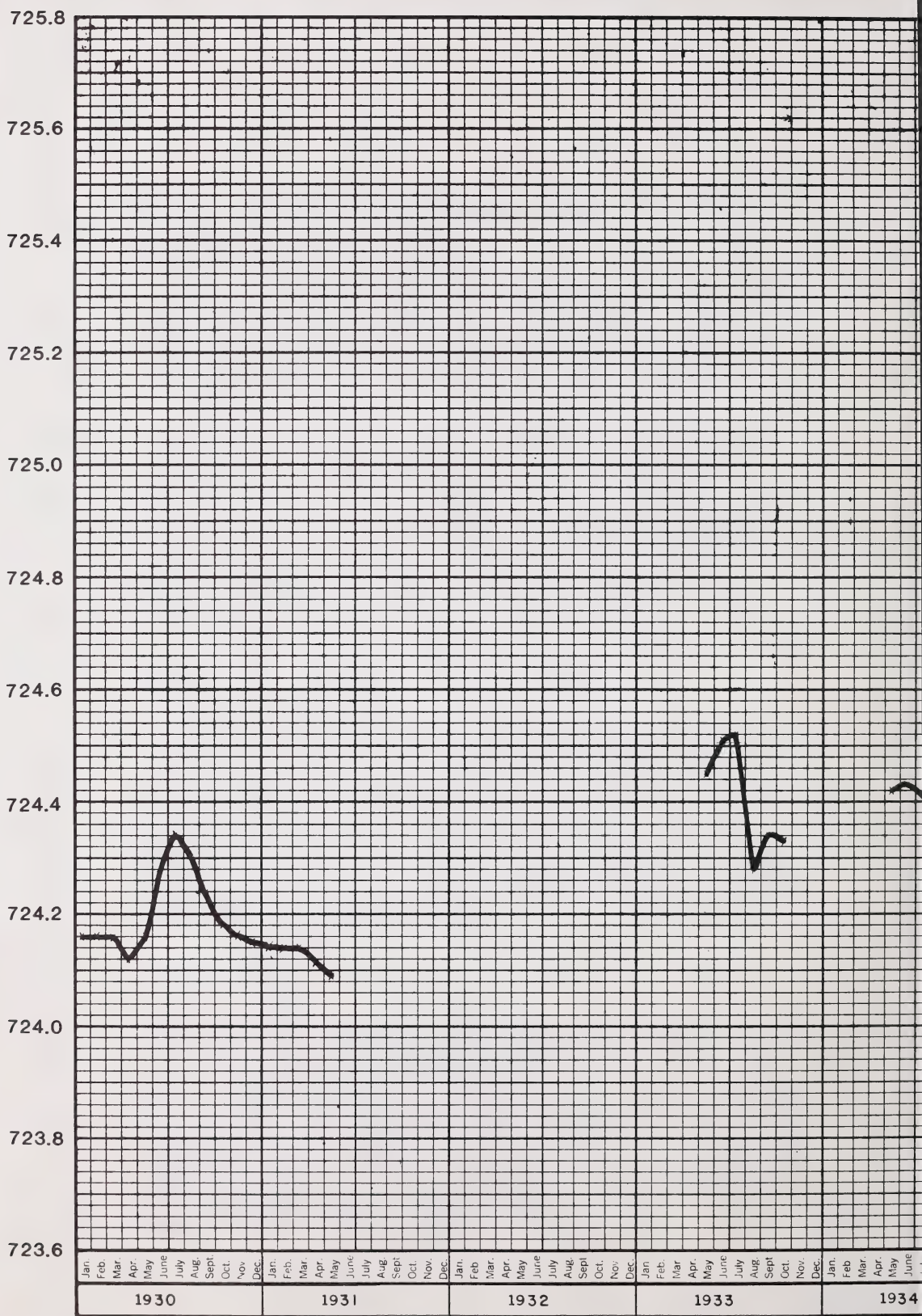
MONTHLY MEAN WATER LEVELS WABAMUN LAKE AT WABAMUN

05DE002

(1920 - 1929)



FIGURE 3 - (3)
LAKE LEVEL IN METRES (G.S.C. DATUM)



MONTHLY MEAN WATER LEVELS WABAMUN LAKE AT WABAMUN

05DE002

(1930 - 1939)

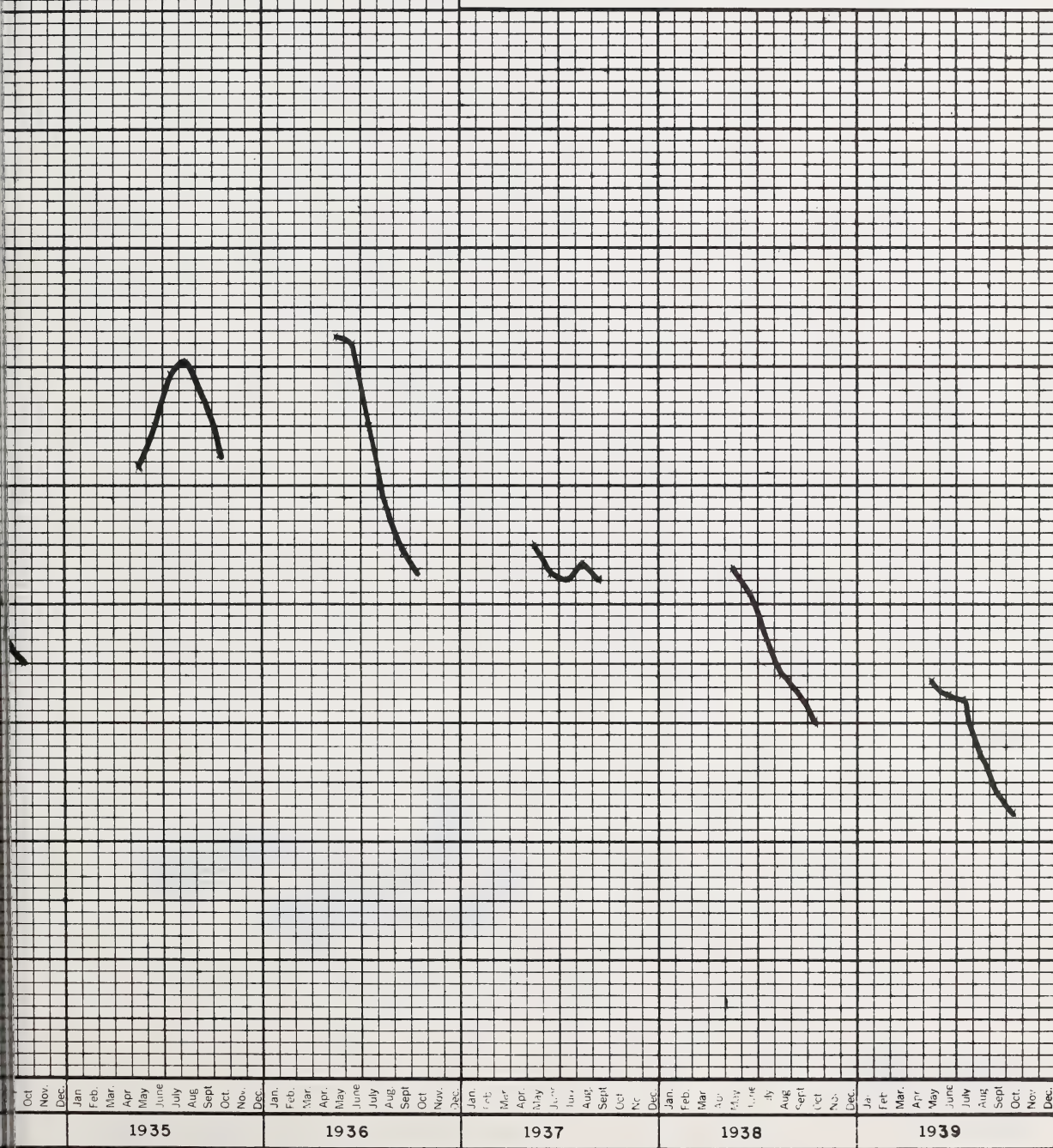
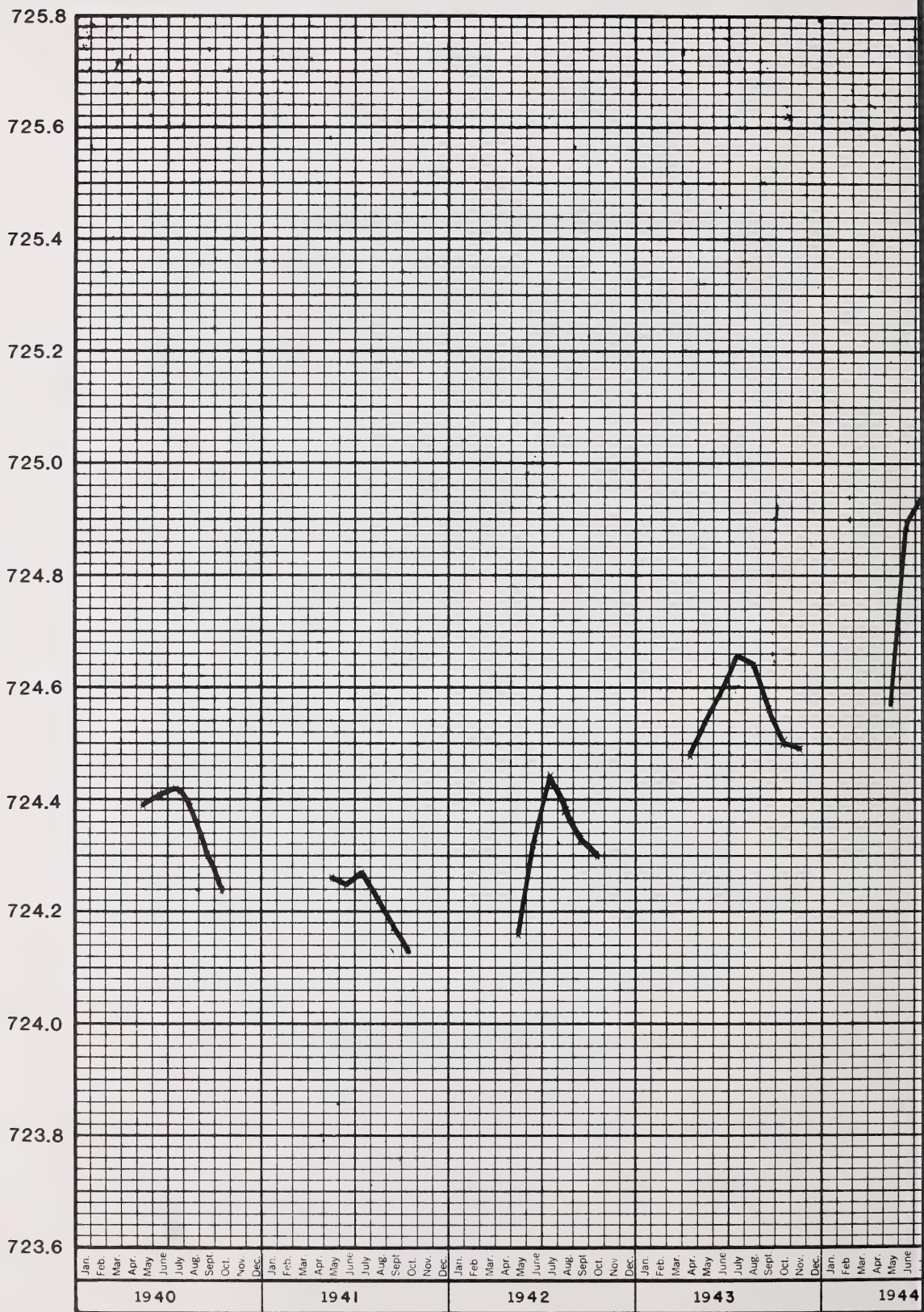


FIGURE 3 - (4)



(1940 - 1949)

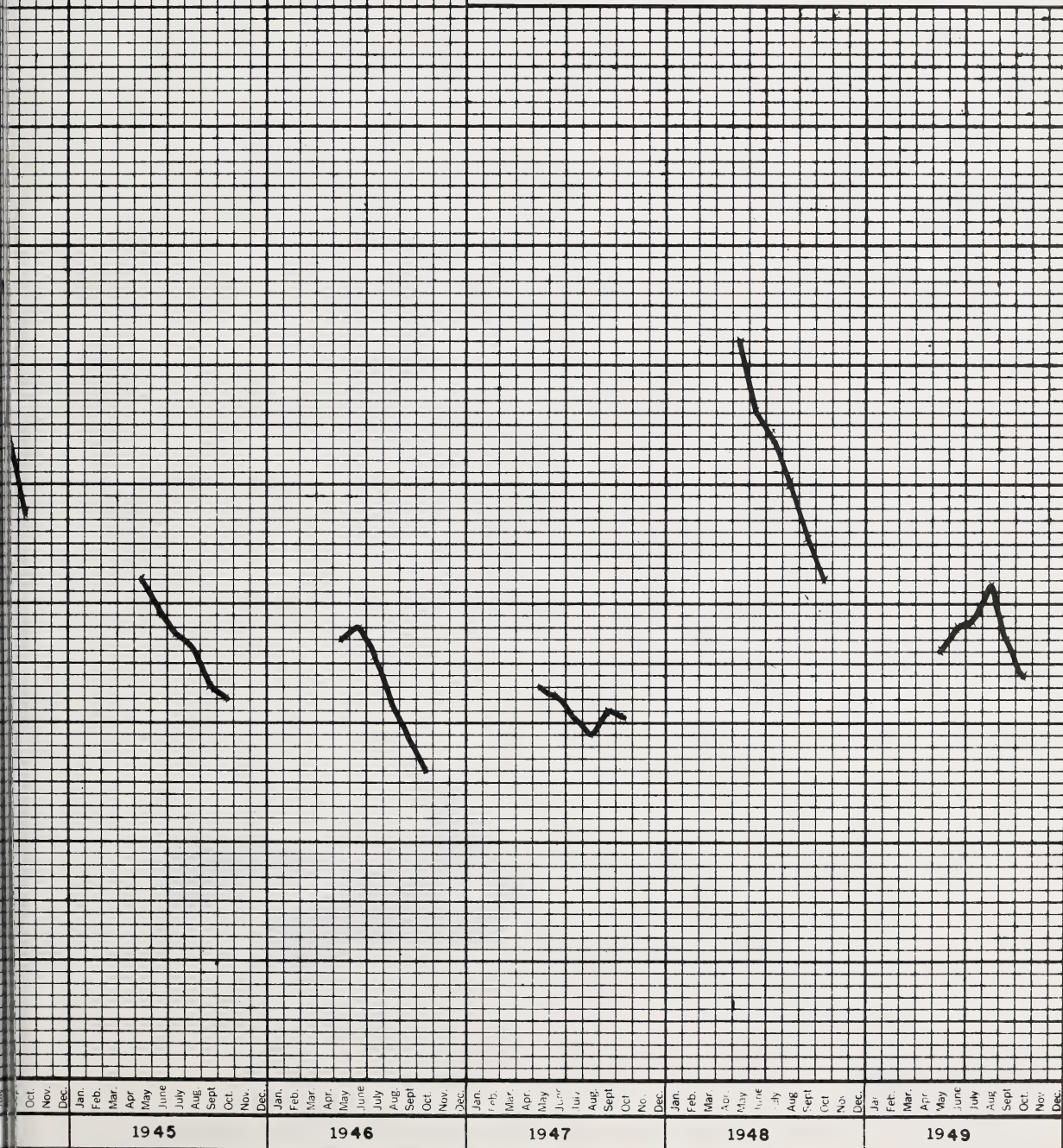
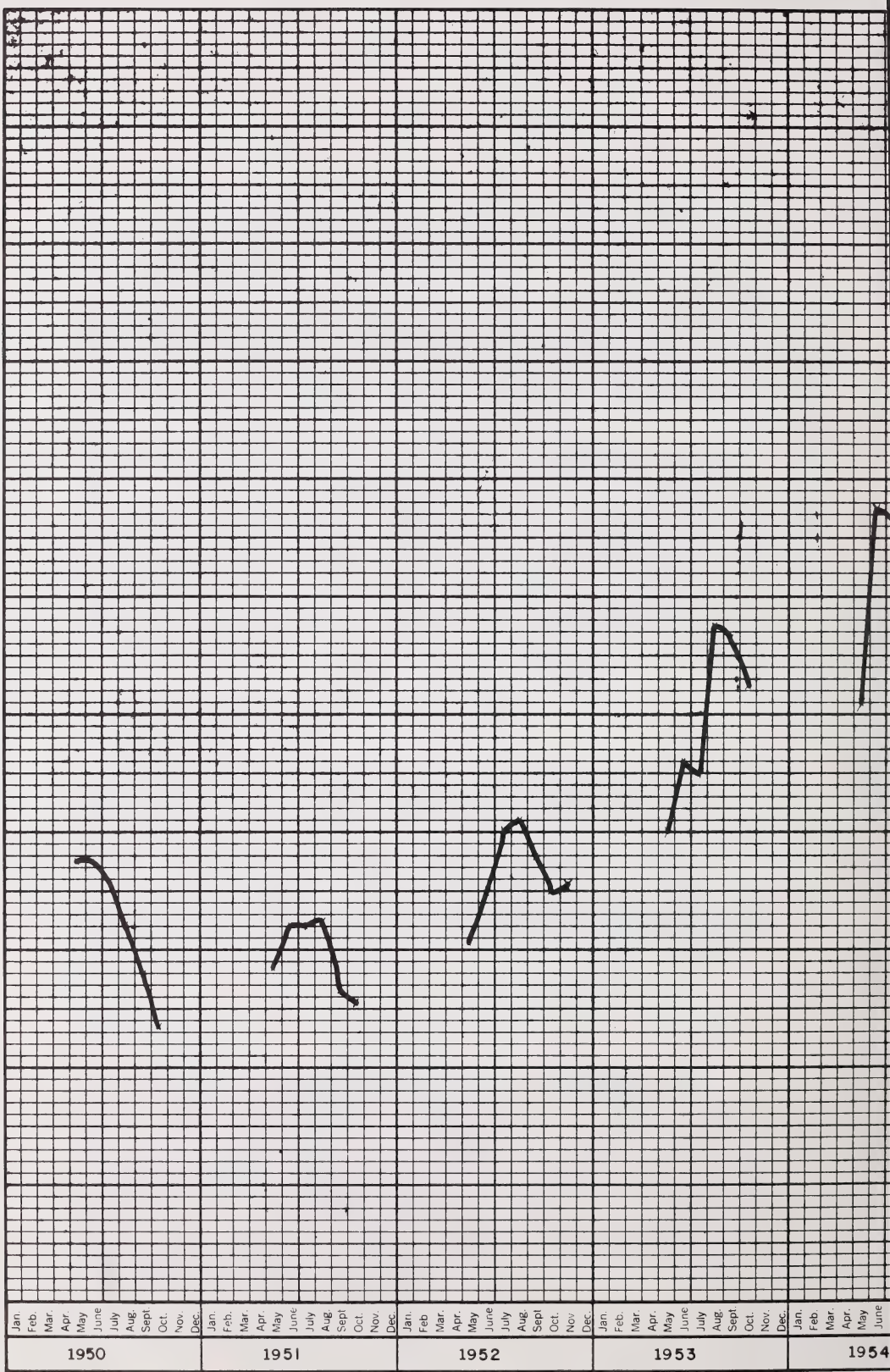


FIGURE 3 - (5)
LAKE LEVEL IN METRES (G.S.C. DATUM)

725.8
725.6
725.4
725.2
725.0
724.8
724.6
724.4
724.2
724.0
723.8
723.6

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July																								
1950												1951												1952												1953												1954						

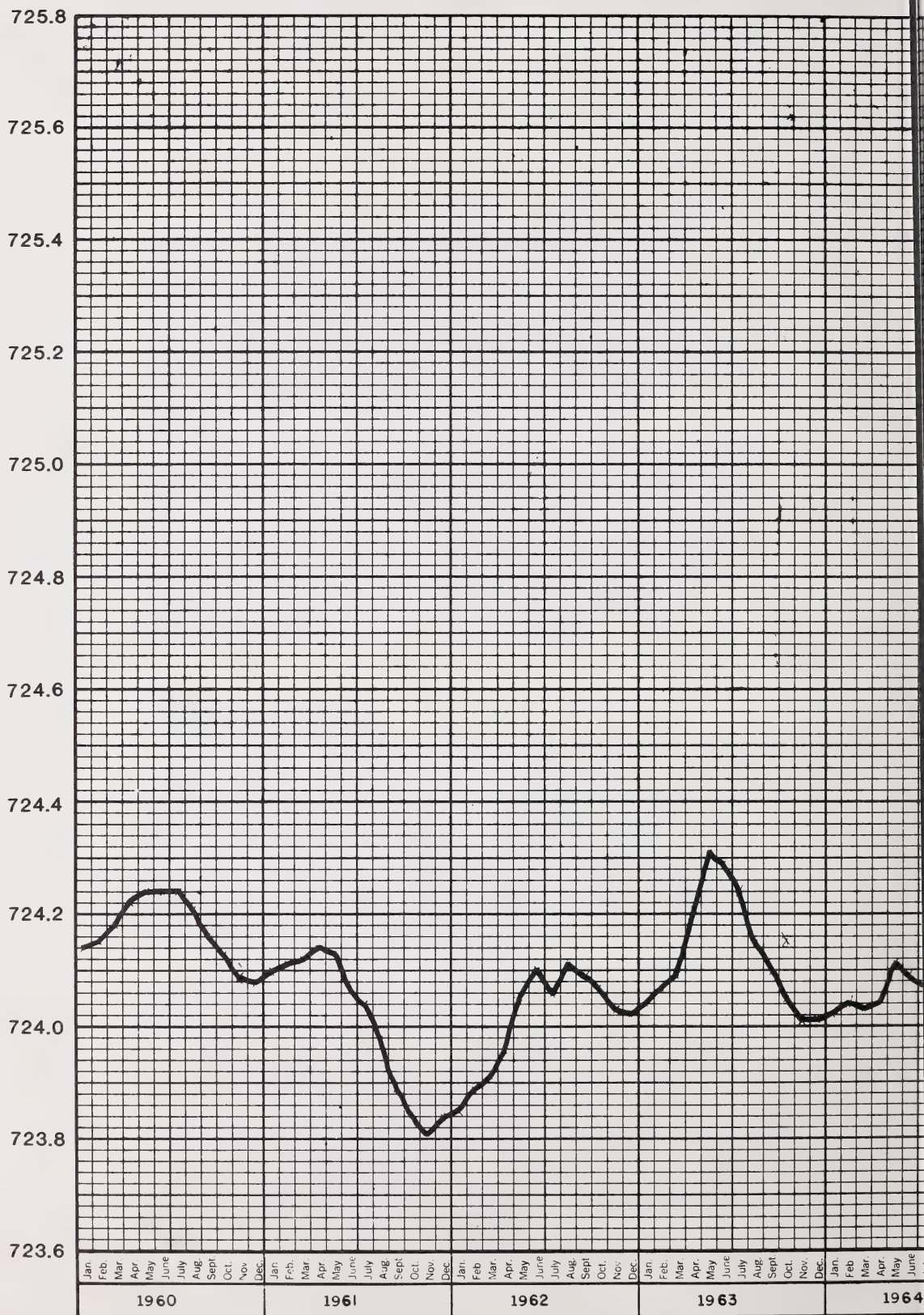


(1950 - 1959)

WABAMUN LAKE AT SEBA BEACH 05DE004



FIGURE 3 - (6)
LAKE LEVEL IN METRES (G.S.C. DATUM)



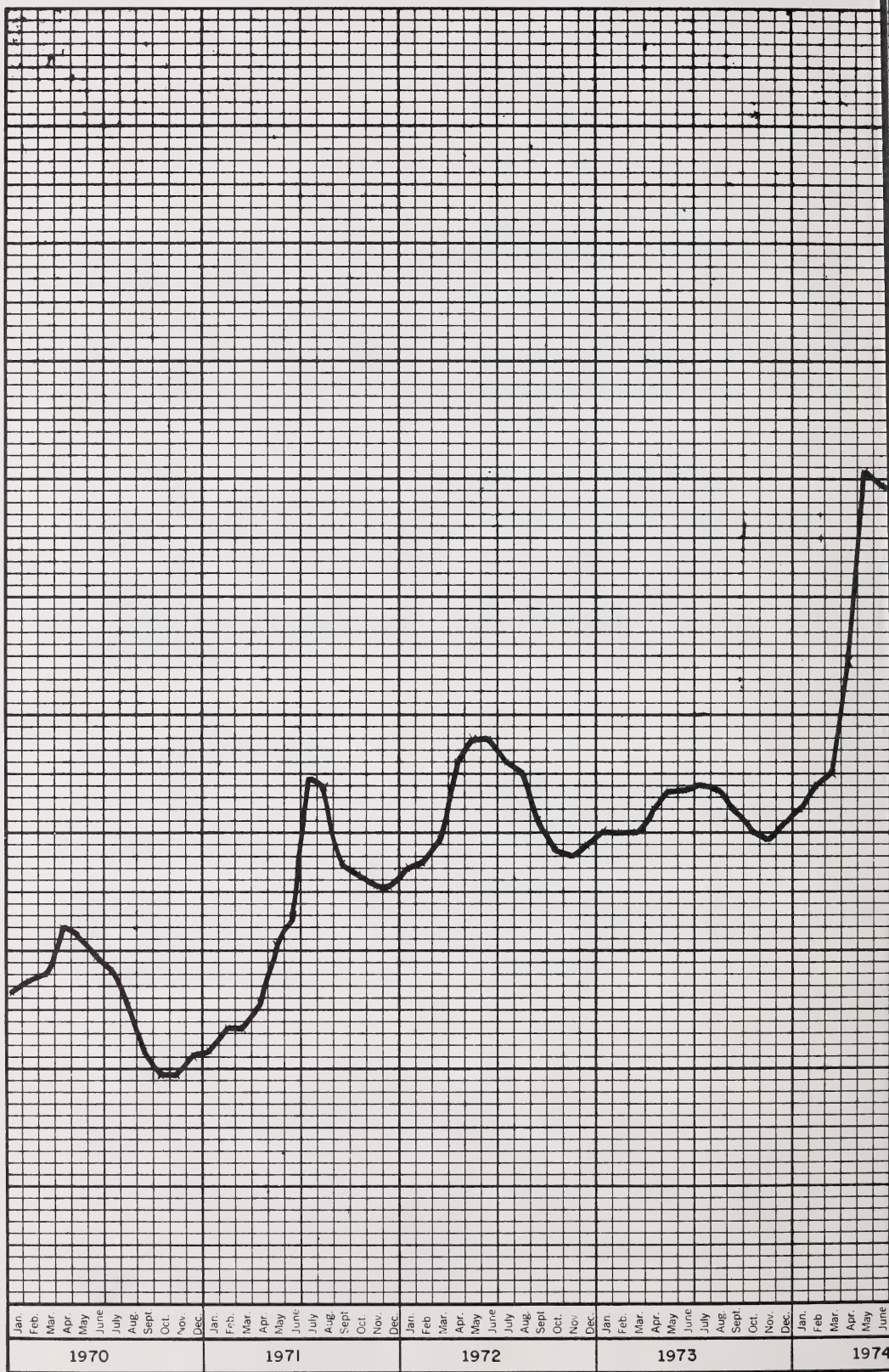
(1960 - 1969)



FIGURE 3 - (7)
LAKE LEVEL IN METRES (G.S.C. DATUM)

725.8
725.6
725.4
725.2
725.0
724.8
724.6
724.4
724.2
724.0
723.8
723.6

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June																								
1970												1971												1972												1973												1974					



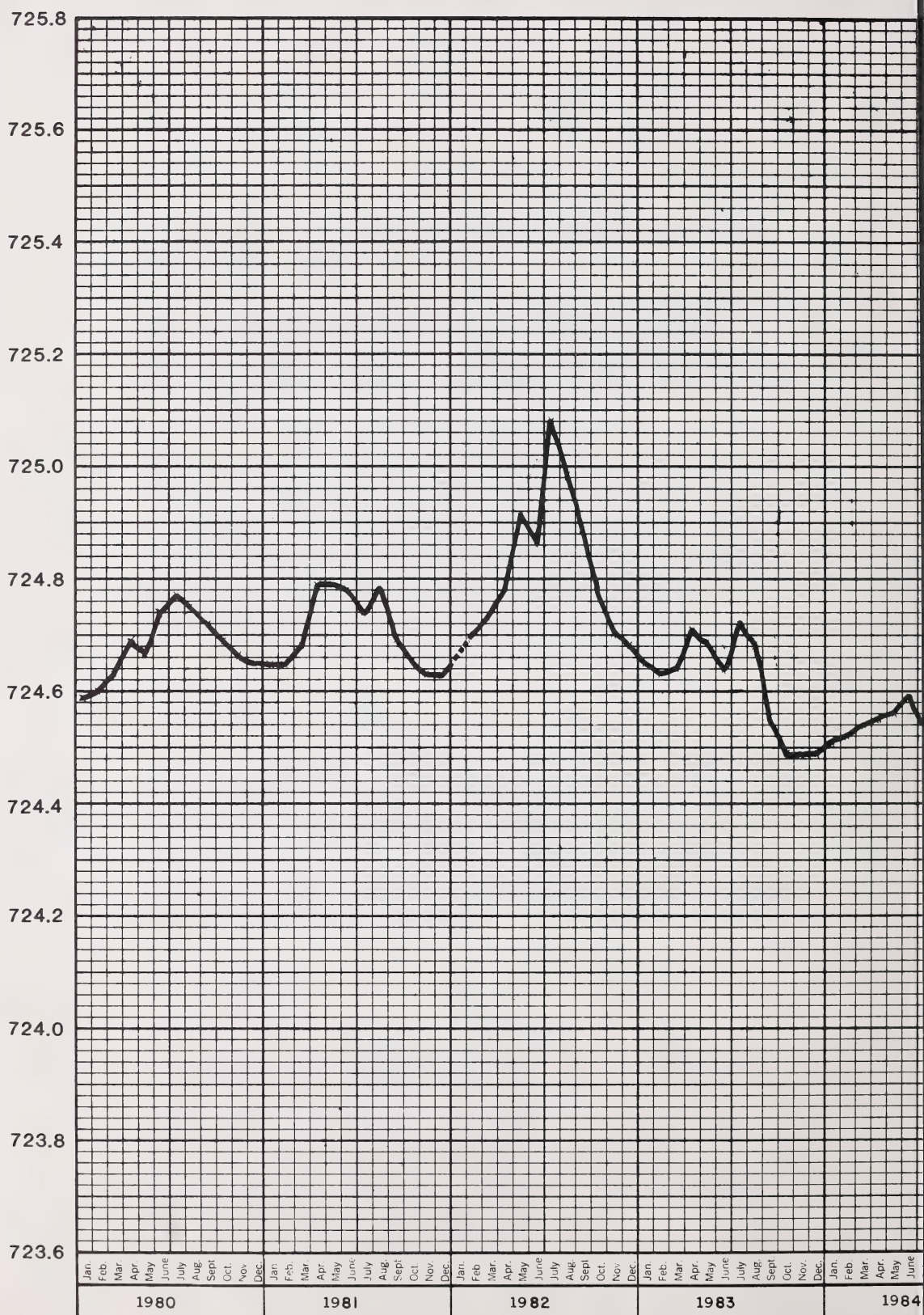
MONTHLY MEAN WATER LEVELS
WABAMUN LAKE AT WABAMUN

05DE002

(1970-1979)



FIGURE 3 - (8)



MONTHLY MEAN WATER LEVELS WABAMUN LAKE AT WABAMUN

05DE002

(1980 - 1989)



MONTHLY MEAN WATER LEVELS
WARREN CREEK AT WARREN

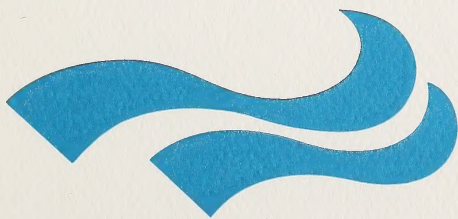
1900-1910

1911-1920

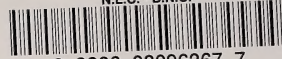
1921-1930



FIGURE 3



NLC - B.N.C.



3 3286 08096367 7